

Attorney Docket No: 27754/X254A

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Stephen Temple et al.

APPLICATION NO.: 09/754,486

FILED: January 3, 2001

FOR: Method of and Apparatus
for Forming Nozzles)
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) Examiner: Stefan Staicovici
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) Art Unit: 1732
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)**AFFIDAVIT OF STEPHEN TEMPLE UNDER 37 C.F.R. §1.132**

I, Stephen Temple, hereby swear as follows:

1. I am one of two joint inventors of the subject matter described and claimed in United States Patent Application Serial No. 09/754,486, (the application) entitled "Method of and Apparatus for Forming Nozzles."

2. I am Technical Director of Xaar plc and one of the founders of the company. I have a degree in Engineering Sciences from Oxford University and am a Fellow of the Royal Society of Arts and Manufacturing in the United Kingdom. I am an inventor of the original inkjet technology on which Xaar was founded, and have invented inkjet technologies covered by more than 90 patents and pending applications.

3. I have reviewed the most recent office action having a date of 15 June 2004 in the application. I have also studied each of the patents used to reject the claims of the application. In this affidavit, I discuss US 5 263 250 (Nishiwaki), US 5 569 238 (Shei) and GB 2 262 253 A (Turner).

4. The examiner has suggested in one rejection of the claims that it would have been obvious to one having ordinary skill in the art at the time of my invention to combine the teachings of Nishiwaki and Shei.

5. In my opinion, such a combination of documents would not have been obvious to the engineer working in the field of inkjet to which my invention specifically relates. Shei relates to an energy delivery system for use in laser eye surgery, a field completely unrelated to inkjet.

6. The inkjet engineer would have no motive to consider teachings in the laser eye surgery field, particularly given that inkjet technology involves the formation of a hole in the surface illuminated by the laser, something completely unthinkable in laser eye surgery.

7. Moreover, Shei describes a method for spatially modulating the fluence in the surgical beam so as to cut a combination of a spherical and a cylindrical surface, i.e., an eye ball. In making inkjet nozzles, the primary consideration is to achieve uniformity of illumination, quite the contrary to the teachings of Shei.

8. Even if the teachings of Nishiwaki and Shei were to be combined, they would still not result in my invention. Nishiwaki describes a system for simultaneously manufacturing multiple inkjet nozzles. See the last two sentences of the abstract of Nishiwaki, for example, which read:

the image of the row of openings is projected onto a plastic plate or the like so that a multiplicity of holes is formed in the plate. As a result, a nozzle plate of an ink jet printer head can be accurately and quickly manufactured.

9. In my invention, only a single aperture is formed, as specified in independent claims 9, 23, and 31 of the application. This runs counter to the intended 'quickly manufactured' advantage of Nishiwaki in that only one nozzle is formed at a time.

10. As noted above, Shei disclosed a method for energy delivery in laser eye surgery and produces only one beam. Modifying Nishiwaki by incorporating the method of Shei would eliminate or destroy the specific goal of Nishiwaki for simultaneously producing multiple beams to form multiple nozzles. Shei is limited to modulation of a single beam.

11. I, among others here at Xaar, have also found that the so-called 'accurate' nozzles achieved by the Nishiwaki method are in fact of lesser quality than those obtained by my invention. Although lower quality nozzles may be acceptable in the kind of disposable bubble-jet printhead made by Canon (the assignee of the Nishiwaki patent), we have found that they are less acceptable for the kind of product made by Xaar.

12. Similarly, nozzles made according to my invention (particularly independent claims 9, 23, and 31 of the application) have a nozzle inlet that is larger in diameter than the nozzle outlet, which again allows higher accuracy ejection of ink droplets and corresponding higher quality images than may be obtained using Nishiwaki.

13. The examiner has cited Turner for its teaching of such tapered nozzles and has stated that it would have been obvious to one having ordinary skill in the art at the time of my invention to modify both Nishiwaki and Shei further in view of Turner. According to the reasons I discuss below, an inkjet engineer would not look to combine Turner with both Nishiwaki and Shei. However, also as I discuss below, even if such a combination were made, the combination of Nishiwaki, Shei, and Turner would not result in my invention.

14. For an alternate rejection of the claims, the examiner has cited Turner in combination with Nishiwaki, without further combining Shei. Turner is cited as evidence that rotation of a laser beam results in an inlet that is larger in diameter than the outlet produced. This generalization is not accurate. Referring to the figure on the front page of Turner, one will see that Turner employs a spherical lens and trepanning of a single beam to create the envelope of the reverse taper. The entire beam is moving (trepanning) around the axis 17, not just rotating about its own axis, to create the tapered hole.

15. In contrast, my invention uses a fixed beam width in an overall array which defines the envelope. Only the input beam to the 'flyeye' lens is rotated so as to produce time-averaged constant energy in all the beamlets issuing from the 'flyeye' lens. The outlet beam that forms the inkjet nozzle of my invention is not rotating. This is contrary to the teachings of Turner, wherein the entire beam impinging upon the aircraft skin 9 is still moving about the axis 17. If the teachings of Nishiwaki and Turner were to be combined, they would not result in my invention, regardless of whether the Shei teachings were also combined.

16. Also, if the Nishiwaki teachings were modified according to Turner, each of the multiple beams in Nishiwaki used to impinge upon a nozzle plate would be trepanning, not merely rotating about a beam axis. Alternatively, since Turner discloses only a single beam forming a single inlet and outlet for a hole in an aircraft wing, modifying Nishiwaki in accordance with Turner would again result in only forming one nozzle at a time, which would be wholly contrary to the specific multiple nozzle formation teachings of Nishiwaki.

17. The above comments regarding Turner ignore the fact that the reference also does not relate to formation of inkjet nozzles or to the field of inkjet generally. Instead, Turner relates to forming air flow nozzles in aircraft wings, a field completely unrelated to inkjet. Thus, it is my opinion that an inkjet engineer would not look to combine the teachings of Nishiwaki with those of Turner, regardless of whether the Shei teachings were also combined.

18. To summarize, my invention as defined in the independent claims incorporates features that are not obvious from a combination of either Nishiwaki, Shei, and Turner, or alternately, only Nishiwaki and Turner. Further, it is my opinion that an inkjet engineer would not look to the teachings of either Shei or Turner when considering modifications to the Nishiwaki inkjet nozzle formation teachings.

19. I hereby affirm that all of the foregoing statements are true and accurate to the best of my knowledge and belief, and that I am aware that any false statements may subject me to penalties for perjury and may jeopardize the validity of any patents that may issue on the present application.

October 14th, 2004


Stephen Temple
Inventor